

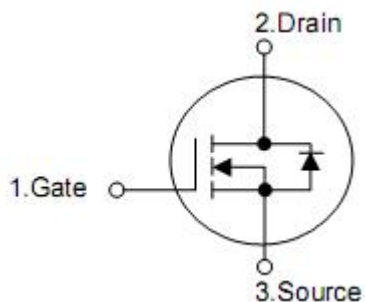
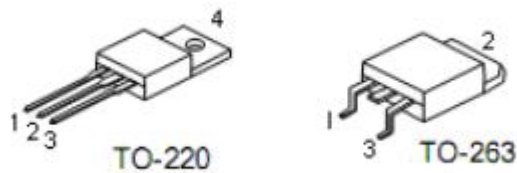
## 1. Features

- $R_{DS(on)}$  (TYP)= 2.2m $\Omega$  @ $V_{GS}$ = 10 V
- Lead free and green device available
- Low Rds-on to minimize conductive loss
- High avalanche current

## 2. Applications

- Power supply
- DC-DC converters

## 3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

#### 4. Ordering Information

Part Number	Package	Brand
KNP2404A	TO-220	KIA
KNB2404A	TO-263	KIA

#### 5. Absolute maximum ratings

Parameter		Symbol	Maximum	Units
Drain-to-source voltage		$V_{DSS}$	40	V
Gate-to-source voltage		$V_{GSS}$	+25	V
Continuous drain current	$T_C=25^{\circ}\text{C}$ (Silicon limited)	$I_D$	190	A
	$T_C=25^{\circ}\text{C}$ (Package limited)		120	
	$T_C=100^{\circ}\text{C}$ (Silicon limited)		109	
Pulsed drain current	$T_C=25^{\circ}\text{C}$	$I_{DP}$	480	A
Avalanche current(L=0.5mH)		$I_{AS}$	46	A
Avalanche energy(L=0.5mH)		$E_{AS}$	529	mJ
Maximum power dissipation	$T_C=25^{\circ}\text{C}$	$P_D$	123	W
	$T_C=100^{\circ}\text{C}$		82	W
Junction & storage temperature range		$T_J, T_{STG}$	-55~150	$^{\circ}\text{C}$

\*Drain current limited by maximum junction temperature.

#### 6. Thermal characteristics

Parameter	Symbol	Typical	Units
Thermal resistance-junction to case	$R_{\theta jc}$	1.02	$^{\circ}\text{C}/\text{W}$
Thermal resistance-junction to ambient	$R_{\theta ja}$	80	

## 7. Electrical characteristics

( $T_A=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static characteristics						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_{DS}=250\mu A$	40	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=64V, V_{GS}=0V$	-	-	1	$\mu A$
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2	-	4	V
Gate leakage current	$I_{GSS}$	$V_{GS}=\pm 25V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_{DS}=30A$	-	2.2	3.5	m $\Omega$
Forward Transconductance	$G_{fs}$	$V_{DS}=5V, I_D=40A$	-	135	-	S
Diode characteristics						
Diode forward voltage	$V_{SD}$	$I_{SD}=40A, V_{GS}=0V$	-	0.9	1.3	V
Diode continuous forward current	$I_S$		-	-	190	A
Reverse recovery time	$t_{rr}$	$I_S=40A, di/dt=100A/\mu s$	-	55	-	nS
Reverse recovery charge	$Q_{rr}$		-	70	-	nC
Dynamic characteristics <sup>2</sup>						
Gate resistance	$R_G$	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	2.0	-	$\Omega$
Input capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=25V, F=1.0\text{MHz}$	-	6010	-	pF
Output capacitance	$C_{oss}$		-	1400	-	
Reverse transfer capacitance	$C_{rss}$		-	675	-	
Turn-on delay time	$t_{d(ON)}$	$V_{DD}=25V, I_D=90A, V_{GS}=10V, R_G=2.7\Omega$	-	25	-	nS
Turn-on rise time	$t_r$		-	102	-	
Turn-off delay time	$t_{d(OFF)}$		-	62	-	
Turn-off fall time	$t_f$		-	84	-	
Gate charge characteristics <sup>2</sup>						
Total gate charge	$Q_g$	$V_{DS}=40V, V_{GS}=10V, I_D=32A, F=1.0\text{MHz}$	-	150	-	nC
Gate-to-source charge	$Q_{gs}$		-	32	-	
Gate-to-drain charge	$Q_{gd}$		-	70	-	

8. Test circuits and waveforms

Fig 1: Output Characteristics

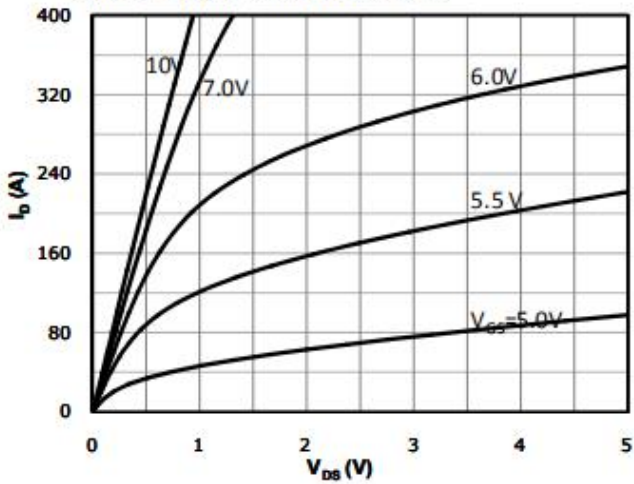


Fig 2: Transfer Characteristics

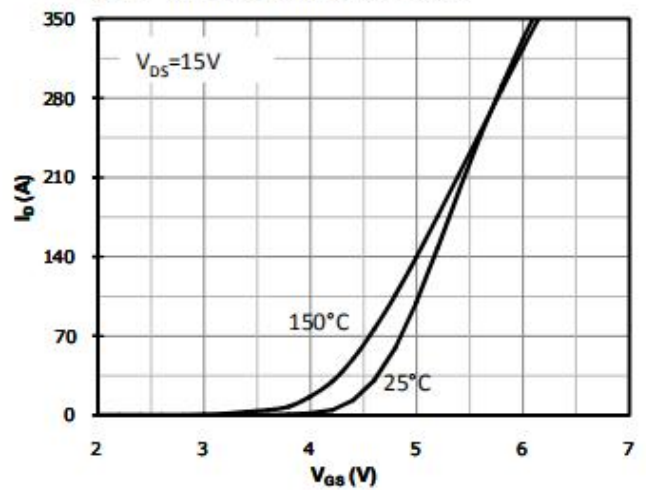


Fig 3: Rds(on) vs Drain Current and Gate Voltage

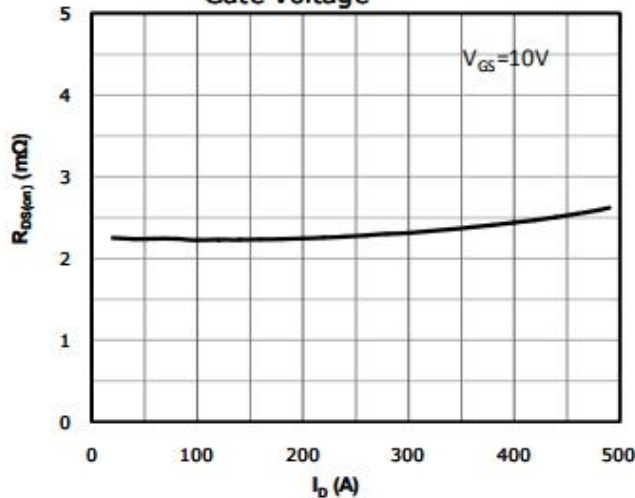


Fig 4: Rds(on) vs Gate Voltage

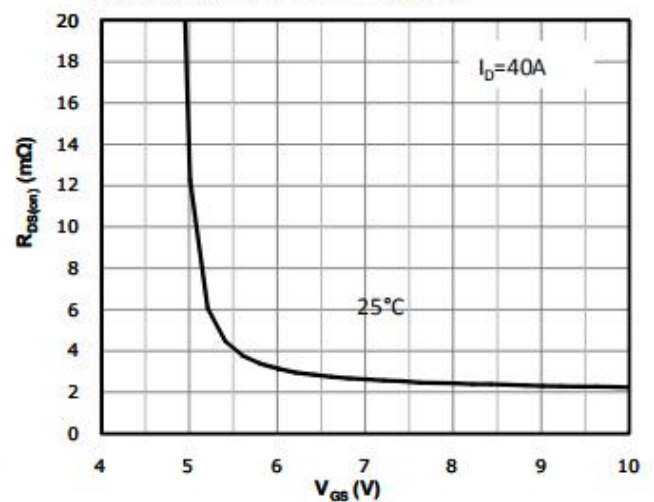


Fig 5: Rds(on) vs. Temperature

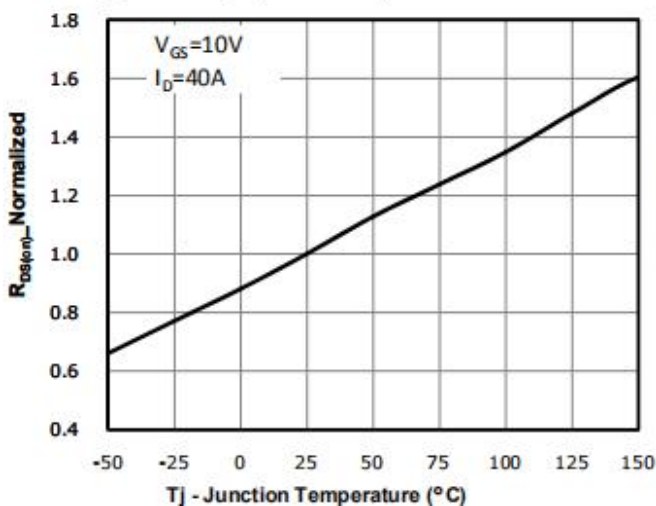
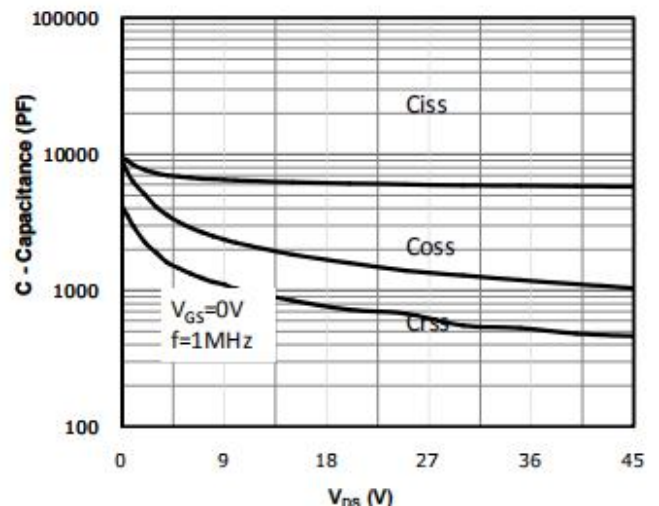
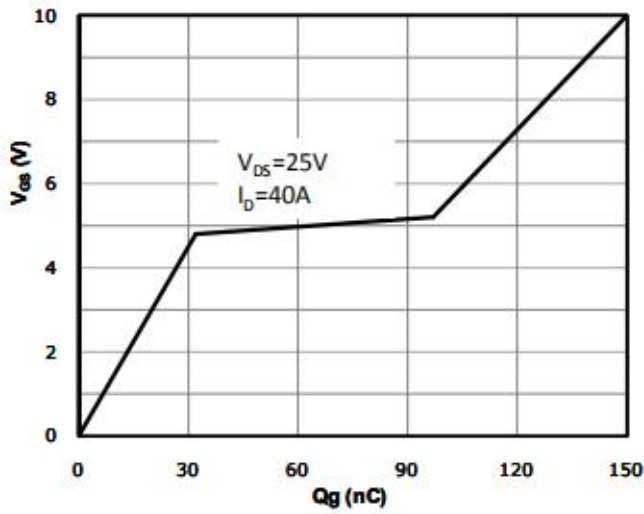


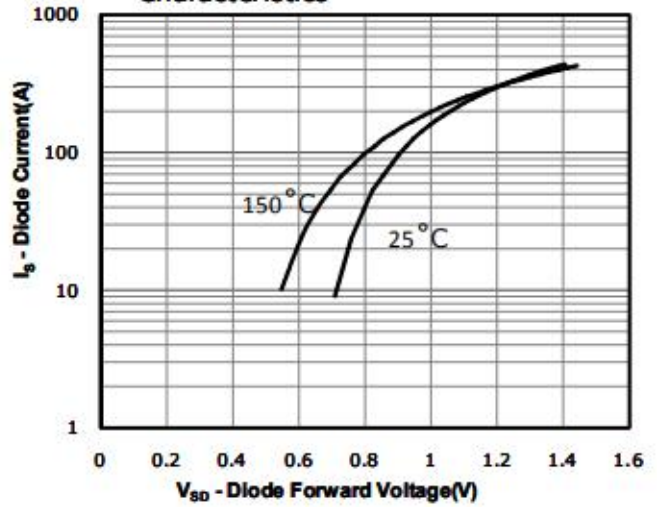
Fig 6: Capacitance Characteristics



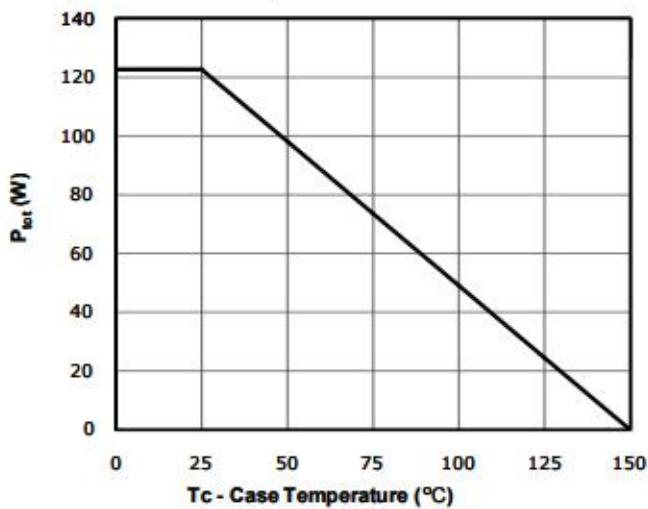
**Fig 7: Gate Charge Characteristics**



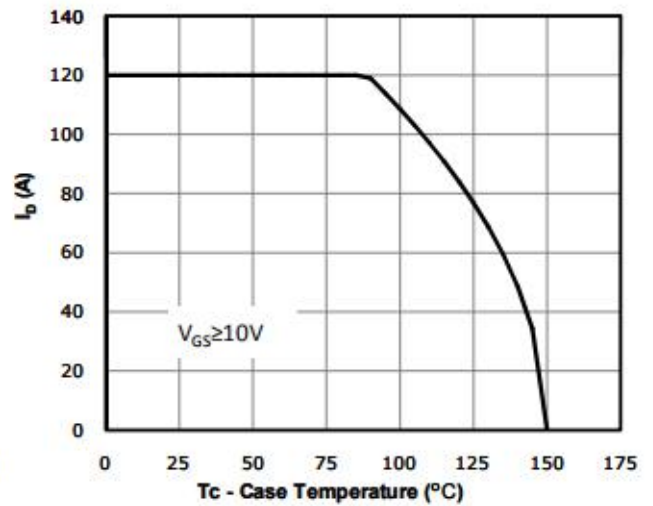
**Fig 8: Body-diode Forward Characteristics**



**Fig 9: Power Dissipation**



**Fig 10: Drain Current Derating**



**Fig 11: Safe Operating Area**

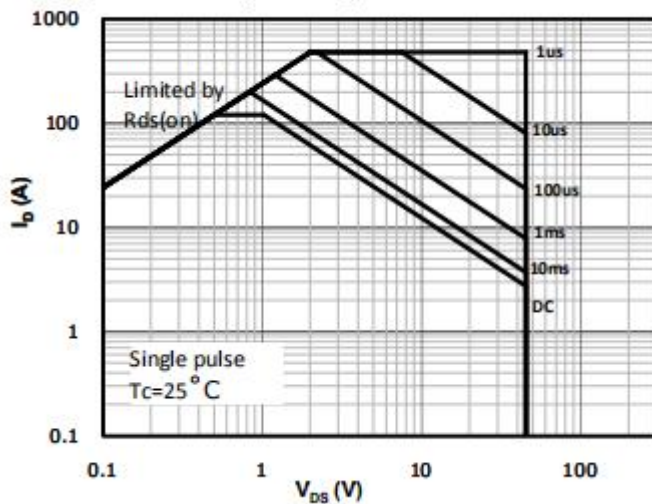


Fig 12: Max. Transient Thermal Impedance

